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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,139	10/28/2003	Kattamuri Ekanadham	YOR920030559US1	6455

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EXAMINER	
INGBERG, TODD D	
ART UNIT	**PAPER NUMBER**
2193	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/695,139	EKANADHAM ET AL.	
	Examiner	Art Unit	
	Todd Ingberg	2193	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13 and 15-20* is/are pending in the application.

4a) Of the above claim(s) *14* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13 and 15-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10/28/2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claims 1 – 13 and 16 – 20 have been examined.

Claim 14 has been canceled.

Claims 16 – 20 have been added.

Claims 1 – 3, 11, 13 and 15 have been amended.

Information Disclosure Statement

1. The IDS filed October 28,2003 was considered in part the last reference was missing a date. If Applicant supplies the date and number of pages the Examiner will hand write the information on PTO-1492 and consider the reference.

Drawings

2. The drawings filed October 28,2003 are objected to as being informal. The following summarizes the problems.

Description of Problem	**Figure Number**
Font too small	1
Characters missing in title	3, 4, 5
Shading too dark	2, 4, 5

Applicant's response is held as responsive. But the drawing should be corrected with response to this Office action.

Claim Rejections - 35 USC § 101

3. The prior rejection under 35 U.S.C. 101 was overcome by amendment and argument. The amended claim has a memory reference which the result of the claimed invention is stored. Page 7 states the trace "can be stored". This is not persuasive. The current Office policy is that the

result must be stored/displayed etc to a computer readable medium. The amended claims appear to store the trace in memory and meet the requirement of the current policy.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1 – 13 and 15 – 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Dean USPN 6,070,009 issued May 30, 2000.

Claim 1
A computer-implemented method of creating a compressed memory reference trace for a program said compressed memory reference trace to be stored in memory associated with a computer running said program (Dean, col 7, lines 5 – 9, CFG as produced by compiler is before optimization – "compressed"), said method comprising: selecting a sequence of events in a control-flow for said program (Dean, col 14, lines 34 – 47); obtaining a sequence of values for each of said events, which values were obtained by executing said program (Dean, col 14, lines 34 – 59 – the sample and the events Dean, col 24, lines 47 – 56, classes of instructions); compressing each said sequence of values to generate a compressed sequence of values for each event program (Dean, col 14, lines 34 – 59 – the sample and the events Dean, col 24, lines 47 – 56, classes of instructions), wherein the collection of compressed sequences of values of events generates a compressed memory reference trace (Dean, as per above and Figure 11 – instruction sequence) : and ordering said values of said compressed memory reference trace according to information in said selected sequence of events in the control flow of said program (Dean, to generate an uncompressed trace of said program (Dean col 22, lines 5 – col 24 line 46 Optimization e.g. one example – Path Profiles - Furthermore, by constraining multiple points along a program's execution path together with recent branch taken history, path profiles are disambiguated. Disambiguation improves with N-wise sampling; i.e., as N increases, disambiguation improves. For heavily executed code, concurrent profiling can reveal the relative order of execution of instructions at each stage of the pipeline 200 for all executing instructions. Thus, one can now statistically reconstruct the actual operation of the execution pipeline 200 in an operational system.); and storing at least one of said compressed memory reference trace and said uncompressed trace (Dean, col 27, line 1 – 6 – optimized program).

Claim 2
A method as recited in claim 1, wherein said values of said compressed memory reference

trace are ordered in order of said selected events. (As per claim 1 – sample of program sequence to be optimized)

Claim 8
A method as recited in claim 2, wherein said information comprises target addresses and wherein said selected events comprise branch instructions. (Dean, col 2, lines 30 – 36 and events of claim 1)

Claim 3
A method as recited in claim 1, wherein said sequence of events for said program is selected by dividing said control flow of said program into blocks of instructions and by associating an event with selected instructions in a block.

Claim 4
A method as recited in claim 3, wherein said program is divided into said blocks according to the occurrence of a branch instruction, where each block has only one branch instruction which is the last instruction in each said block. (Dean, col 22, line 60 to col 23, line 14).

Claim 5
A method as recited in claim 1, wherein each said sequence of values for each said event is compressed based upon recognized patterns in each said sequence. (Dean, col 14, 33 – 47 – patterns in profiling)

Claim 6
A method as recited in claim 5, wherein said recognized patterns comprise at least one of the following patterns: strided patterns (Dean , col 14, 47 – 59) and repeat patterns (as per claim 5).

Claim 7
A method as recited in claim 1, wherein said selected events are branch instructions and wherein values for latter said selected events are branch targets taken by said branch instructions. (Dean, col 15, line 13 – line 52).

Claim 9
A method as recited in claim 1, further comprising the step of: using said compressed sequence of values for an event corresponding to a load instruction to pre-fetch values during the execution of a program. (Dean, col 24, line 47 - 50, event = load and Dean, col 27, line 5 – 54)

Claim 10
A method as recited in claim 1, further comprising the step of:
using said compressed sequence of values for an event corresponding to a branch instruction to perform branch prediction during the execution of a program. As per claim 9.

Claim 11

A method as recited in claim 1, further comprising: dividing said compressed memory reference trace into segments, wherein said sequence of compressed values in a segment corresponds to a contiguous sequence of values in said uncompressed trace. CFG of claim 1 by definition.

Claim 12
A method as recited in claim 11, wherein a segment is terminated at the end of a block such that the size of the segment is between two predetermined values. (Dean, col 23, lines 7 – 14)

Claim 16
The method as recited in claim l further comprising the steps of:' analyzing said compressed memory reference trace to identify patterns of program behavior; and utilizing said patterns to optimize program execution. As per claim 5.

Claim 17
The method as recited in claim 16 wherein said utilizing comprises performing pre-fetching. As per claim 9.

Claim 18
The method as recited in claim 16 wherein said utilizing comprises performing branch prediction. As per claim 7.

Claim 13
A program storage device readable by a digital processing apparatus and having a program of instructions which are tangibly embodied on the storage device and which are executable by the processing apparatus to perform a method of creating a compressed memory reference trace for a program for storage of said compressed trace in a memory associated with said processing apparatus, said method comprising: selecting a sequence of events for said program: obtaining a sequence of values far each of said events, which values were obtained by executing said program: compressing each said sequence of values to generate a compressed sequence of values for each event, wherein the collection of compressed sequences of values of all events generates a compressed memory reference trace for storage in a memos associated with said processing apparatus; and ordering said values of said compressed memory reference trace to generate an uncompressed trace of said program. As per the rejection for claim 1.

Claim 19
The program storage device as recited in claim 13 wherein the method further comprises the steps of: analyzing said compressed memory reference trace to identify patterns of program behavior: and utilizing said patterns to optimize program execution. As per claim 5.

Claim 15
An computer apparatus for creating a compressed memory reference t race of a program, said apparatus comprising: means for selecting a sequence of events for said program; means for obtaining a sequence of values for each of said events, which values were obtained by executing said program; means for compressing each said sequence of values to generate a compressed

sequence of values for each event, wherein the collection of compressed sequences of values of all events generates a compressed memory reference trace; and means for ordering said values of said compressed memory reference trace to generate an uncompressed trace of said program, and means for storing at least one of said compressed memory reference trace and said uncompressed trace. As per claim 1.

Claim 20
The apparatus as recited in claim 15 further comprising: means for analyzing said compressed memory reference trace to identify patterns of program behavior to exploit to optimize program execution. As per claims 1 and 5.

Response to Arguments

6. Applicant's arguments with respect to claim1 – 14 and 16 – 20 have been considered but are moot in view of the new ground(s) of rejection.

7. Applicant's claims are now directed toward the runtime environment as is the base reference. The Bacon reference is still relevant. One of ordinary skill in the art would know the history of computer program profiling and how in the 1980's the profiler captured heuristics then the recompilation of the traces was used to optimize the program call structure (Borland 1988 and 1991 as made of record FAOM). These ancient techniques are also covered in the Bacon reference. One of ordinary skill would also know that in the 1990s runtime optimization became of age. And the techniques implemented in compile time optimization are the basis of runtime techniques. The new base reference is runtime and being runtime the allocation of memory is known. It is important to point out the current base references specifically mention the memory references of the runtime environment. the Bacon reference refers to symbol names that in the runtime environment are assigned memory references. Module names, Loop bounds etc are covered by the Bacon reference and teach the fundamental underlying theory that is implemented

in runtime optimization. The teaching of Bacon can not be eliminated as not relevant or relevant to non runtime optimization only.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Todd Ingberg whose telephone number is (571) 272-3723. The examiner can normally be reached on during the work week..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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